"There is something beautiful and touching, in the associations that grow up in a home held sacred in the same family for generations. A wealth of affection is kept alive in those old manor-houses and country halls of England, where, age after age, the descendants of one family have lived, and loved, and suffered, and died,—perhaps nobly and bravely too, sheltered by the same trees and guarded by the same walls. It is quite natural that we, largely descended from this Anglo-Saxon stock, when we have fortunes to spend, should fondly delude ourselves with the idea of realising this old and pleasing idyl of beautiful country life. But it is only an idyl, or only a delusion to us. It belongs to the past, so far as we are concerned. It is no more to be reanimated in the republic of the new world than the simple faith in the Virgin, which built the mighty cathedrals of the Middle Ages. It could only be reanimated at the sacrifice of the happiness of millions of free citizens."

He gives a very useful chapter on ventilation, and says, in conclusion, "that, fond as our people are of improvement, the greatest possible improvement in a dwelling-house—ventilation, is as yet a thing almost unknown in this country; though we predict, that in a few years, the man who warms his room by a close stove, with no ventilator, will be looked upon as little better than him who should more openly undertake to poison his family and friends with a brasier of charcoal."

There is much good sense and ability manifested in Mr. Downing's book, and we stretch our arm across the "big water" to tender to our Yankee coadjutor an English shake and a friendly recognition.

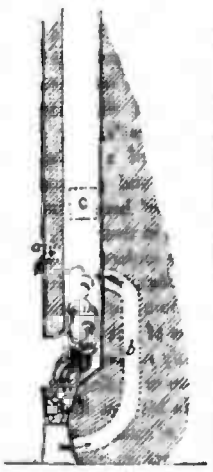
CAUSE AND CURE OF SMOKY CHIMNEYS.

Having, in the foregoing papers,* taken some trouble to explain the philosophical principles involved in the action of chimneys, in order to demonstrate clearly the fact that the *primary* cause of their action is the *rarefaction of air*: and having seen how this primary cause operates, we may consider ourselves sufficiently prepared to enter upon the consideration of the causes which produce *imperfect action*, or what is familiarly called the "Smoky Chimney." We will proceed to do so by arranging these causes into five distinct classes, viz.:—Firstly, deficient rarefaction; secondly, deficient supply of air; thirdly, the action of winds; fourthly, deficient capacity of flues; fifthly, the influence of adjacent chimneys. We will examine these five classes in all their bearings seriatim.

First, then, as to *deficient rarefaction*. We have seen that rarefaction in chimneys is produced by *heat*, and it follows, therefore, that anything which operates to cool the air in a chimney tends to impair rarefaction. Now, this may result from either of two distinct causes: first, the admission of cold air into the chimney; and, secondly, the radiation of heat through the material of which the chimney is constructed. The first of these, the admission of cold air, may be brought into operation in a variety of ways, of which the following may be considered the principal, because of most common occurrence: viz., *large openings* at the fire-place, that admit air into the chimney without its having been sufficiently within the influence of the fire, to produce the required degree of rarefaction; *dust flues* leading from the ash-hole behind the fire-grate into the chimney above the opening; *flues entering from other fire-places*, which, when not in use, supply cold and therefore unrarefied air from the rooms in which they are situated; *ventilators* in the chimney breast for the purpose of carrying off the impure air of rooms, which is always at a much lower temperature than that in the chimney, and therefore the rarefaction of the latter is impaired; *lateral openings* of any description which admit air of a lower temperature than that in the chimney at the point at which it enters; *imperfect joints, or holes*, in the partitions of adjoining chimneys, which have the effect of admitting cold air from those chimneys when not in use.

* See pp. 388 and 389, vol. VIII.; and p. 4, vol. IX.

The result of the admission of cold air being the same in all the above, and, in fact, in all cases whatever; one illustration will serve for all. For this purpose, then, let us suppose the diagram, fig. 9, to represent the section of a chimney where A is an ordinary stove grate, B the opening of the fireplace, and the dotted lines at *a*, *b*, and *c*, respectively, a *ventilator*, a *dust-flue*, and a *flue* entering from an adjacent fireplace. We will take the temperature of the air in the chimney to be 120° Fahrenheit, that of surrounding atmosphere being 60°; and the velocity of the *current* or "draught" 10 cubic feet per second. Now, if we suppose the gas, or smoke to be evolved from the burning coal at the rate of 10 cubic feet per second, the velocity of the *current* in the chimney being also 10 cubic feet per second, it is obvious that all the smoke from the fire would be carried off. But if we introduce into the same chimney either a ventilator *a*, a dust-flue *b*, or a flue from an unused fireplace *c*, the external air, by reason of its superior gravity, will flow through such openings; and, mixing with the heated air in the chimney, will reduce its temperature, and, consequently, increase its specific gravity or weight. We have already seen (page 279) that the velocity with which one fluid rises through another is proportionate to the difference of their specific gravities; and, therefore, by increasing the specific gravity of the air in the chimney, we diminish the velocity with which it rises. Suppose, then, that a sufficient quantity of cold air has been admitted to reduce the velocity of the *current* to 9 cubic feet per second, the volume of gas or smoke being still the same, i.e. 10 cubic feet per second; it follows that there is evolved 1 cubic foot of smoke per second more than can pass off by the chimney: it therefore backs into the room in which the fire is situated; or, in other words, the "chimney smokes."



It may not be out of place to observe here, that during the whole time that the process of combustion is maintained in a fire grate, various gases continue to be evolved from the burning coal, of which carburetted hydrogen and carbonic acid constitute the chief portion. These two gases are given off in an inverse ratio, i.e. when there is most carburetted hydrogen there is least carbonic acid, and *vice versâ*. For example, when fresh coals are put on a fire, a dense yellow smoke rises, which is chiefly carburetted hydrogen, highly charged with carbonaceous matter. As the coal burns to a cinder, carbonic acid gas begins to be more freely evolved; and when the coal is completely incinerated, carbonic acid forms the chief portion of the gas generated: it is perfectly transparent, and being combined with sulphuretted hydrogen, it possesses a strong sulphureous smell, and produces a stifling sensation when breathed.

The second cause of deficient rarefaction above alluded to, i. e. the radiation of heat through the material of which the chimney is constructed, operates differently, inasmuch as the heat, or *caloric*, is abstracted from the air: in the former case it is merely diluted by the admission of cold air.

All material substances possess the property of absorbing or conducting heat, but there is great difference in their conducting power; or instance, we say that copper is a good conductor of heat, and wood a very inferior one. All substances contain heat, or *caloric*, in a greater or less degree, and such is its nature that it is continually passing from one body to another, endeavouring to produce an equilibrium or balance of temperature; or, in other words, tending to produce one uniform temperature throughout all nature. For example, if we take a vessel of water heated to the temperature of 100° Fahrenheit, and place within it a block of iron at 50° Fahrenheit; in the course of a few seconds the temperature of the water falls considerably, and we will then find that the heat lost from the water has passed into the iron and raised its temperature correspondently. Now if the vessel be of iron, the heat will enter readily into it until it become as hot as the water contained by it: and being a conductor, in common with all other matter, the heat will pass off from the outer surface as fast as it enters the inner surface of the vessel, and it will be absorbed by whatever substance chances to be in contact with the outer surface. If this substance be atmospheric air, then the heat will continue to pass through the sides of the iron vessel, until the water be reduced to the same temperature, when the absorbent power of the atmosphere ceases.

In the case of a chimney, a certain amount of heat is constantly passing through the material of which it is constructed into the atmosphere; which, being at a much lower temperature, greedily receives it. As this abstraction of heat goes in, the rarefaction is impaired; the air in the chimney becomes heavier, and therefore offers a greater resistance to the impelling column of cold air at the opening to the fire place; the *current* or "draught" of the chimney is impaired, as already described, and the chimney "smokes."

Chimneys are also subject to a more powerful abstractor of heat than the atmosphere, *i. e.* rain. In rainy weather there is a constant evaporation kept up at the outer surface of the chimney by the rain which falls upon it, which abstracts the heat rapidly from the air inside; and here lies the cause of imperfect action in those chimneys which "never smoke except in wet weather."

The conducting powers of those materials of which chimneys are generally, either partially or wholly, constructed, rank in the following order:—1st, iron; 2nd, zinc; 3rd, stone; and 4th, brick,—iron being the best conductor, and therefore the least fitted for the construction of chimneys. Tba.

ON THE STUDY AND APPLICATION OF ART.*

The subject which I have chosen for consideration is one which, from the thoughts it gives rise to, may lead us occasionally into a grave mood; so, for its profitable entertainment, may it exert a more than usual claim upon attention. Among so many capable of entering into the practical niceties of your profession, I do not fear disapprobation for selecting subjects of a general character and application, and which mainly affect architecture, not exclusively in itself, but as a branch of art universal—a branch which must, however, draw its nourishment, like all the other branches, from the one parent tree, and be trained in a like manner with them. It is, then, of that mode of training I propose to speak, being free to confess my opinion, that by many followers of individual arts, not only are the principles of general art, but the modes of improving any art, too often forgotten, and consequently a want of particular success attends that oblivion, which a more liberal grasp of mind—a greater care—would tend to obviate; that is, to return to a former figure, some expect their favourite branch to flourish by other means of culture than that adopted for the rest, and then wonder that, so far as they are concerned, it withers. If I should appear, in the course of this paper, to speak at times with some degree of freedom, attribute it rather to zeal than to assumption—a zeal, indeed, in one sense more selfish than not,—that by the free expression of my own opinion and experience, I may find them the better

* Read by Mr. H. T. Braithwaite at the Architectural Association, as mentioned last week.

For more information on PDF Compression and OCR go to our website